

Scope of Claims

1. A curable resin composition which comprises (i-1) an epoxy compound having an ionic polymerizability and viscosity of not more than 1,000 cP at 25°C, (i-2) an acrylic resin having an ionic polymerizable functional group, and (3) a thermally-activating ionic polymerization catalyst which can be dissolved by heating and crystallized by cooling.

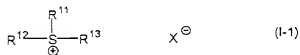
2. A curable resin composition as claimed in claim 1, wherein said epoxy compound (i-1) has 1-2 pieces of epoxy groups in the molecule, at least one piece of said epoxy groups is a cycloaliphatic epoxy group.

3. A curable resin composition as claimed in claim 1 or 2, wherein said acrylic resin (i-2) has hydroxyl group and, glycidyl group and/or a cycloaliphatic epoxy group.

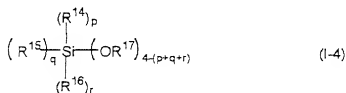
4. A curable resin composition as claimed in any one of claims 1-3, wherein said thermally-activating ionic polymerization catalyst (3) contains at least one selected from the group consisting of a cationic polymerization catalyst (3') and a metal compound (3").

5. A curable resin composition as claimed in claim 4, wherein said cationic polymerization catalyst (3') is a compound having a substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 or at least one cyclic organic structure containing a substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 in the molecule.

6. A curable resin composition as claimed in any one of claims 4-5, wherein said cationic polymerization catalyst (3') is at least one selected from the group consisting of a sulphonium salt represented by general formula (I-1), an iodonium salt represented by general formula (I-2), an aromatic iron compound represented by general formula (I-3), an organic silicone compound represented by general formula (I-4), and a compound represented by general formula (I-5).



(in the general formulae, R^{11} , R^{12} , and R^{13} may be identical to or different from each other, and which are a hydrogen atom, a substituted or nonsubstituted hydrocarbon group of a carbon number of 1-30, and a substituted or nonsubstituted aromatic group or heteroaromatic group, respectively, provided that there is contained at least one substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 or at least one cyclic organic structure containing a substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 in the molecule. X is SbF_6 , AsF_6 , PF_6 , or BF_4 , and an anionic derivative therefrom in which at least one piece of fluorine atom is substituted with hydroxyl group, an anion selected from the group consisting of CF_3SO_3 , ClO_4 , a halogen atom, $\text{R}^1\text{-COO}$, and $\text{R}^2\text{-SO}_3$. Herein, R^1 and R^2 are an alkyl group or phenyl group which may be even substituted with an alkyl group, a halogen atom, nitro group, cyano group, and alkoxy group, etc.)

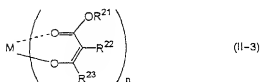
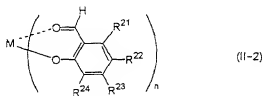
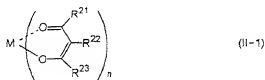


(in the general formula, R^{14} , R^{15} , R^{16} and R^{17} may be identical to or different from each other, and which are a hydrogen atom, a substituted or nonsubstituted hydrocarbon group of a carbon number of 1-30, and a substituted or nonsubstituted aromatic group or heteroaromatic group, respectively, provided that there is contained at least one substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 or at least one cyclic organic structure containing a substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 in the molecule. "p", "q", and "r" are an integer of 0-3, and "p+q+r" is not more than 3.)



(in the general formula, Ar^1 is a substituted or nonsubstituted aromatic group or heteroaromatic group, R^{18} may be identical or different, and which is a hydrogen atom, a substituted or nonsubstituted hydrocarbon group of a carbon number of 1-30, and a substituted or nonsubstituted aromatic group or heteroaromatic group, respectively, provided that there is contained at least one substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 or at least one cyclic organic structure containing a substituted or nonsubstituted hydrocarbon group of a carbon number of not less than 10 in the molecule. "k" and "n" are an integer of 1-7, respectively.)

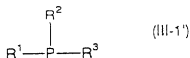
7. A curable resin composition as claimed in any one of claims 4-6, wherein said metal compound (3') is at least one kind selected from the group consisting of a compound represented by general formula (II-1), a compound represented by general formula (II-2), and a compound represented by general formula (II-3).



(in the general formula, R^{21} , R^{22} , R^{23} , and R^{24} may be identical to or different from each other, and which are a hydrogen atom, a substituted or nonsubstituted hydrocarbon group of a carbon number of 1-30, respectively, provided that there are contained at least one of R^{21} , R^{22} , R^{23} , and R^{24} having a carbon number of not less than 10 in one ligand. M is selected from the group consisting of Al, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zr, Zn, Ba, Ca, Ce, Pb, Mg, Sn, and V. "n" is a integer of 2-4.)

8. A curable resin composition as claimed in any one of claims 1-7, wherein said thermally-activating ionic polymerization catalyst (3) contains said metal compound (3") and at least one kind selected from the group consisting of an organosilane having hydroxyl group directly connected to silicone atom, an organosiloxane having hydroxyl group directly connected to silicone atom, a phenol compound, an organic silicone compound having hydrolyzable group directly connected to silicone atom, and a silicone compound which can produce silanol group by photo-irradiation.

9. A curable resin composition as claimed in any one of claims 1-3, wherein said thermally-activating ionic polymerization catalyst (3) contains at least one kind selected from the group consisting of a compound represented by general formulae (III-1') and (III-2),

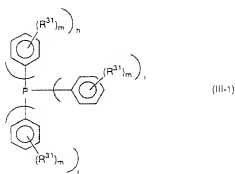


(in the general formula (III-1'), R^1 , R^2 , and R^3 may be identical to or different from each other, and which are a hydrogen atom, a substituted or unsubstituted hydrocarbon group of a carbon number of 1-30, and an aromatic group or heteroaromatic group having a substituted or unsubstituted hydrocarbon group, respectively, provided that there is contained at least one substituted or unsubstituted hydrocarbon group of a carbon number of not less than 10 or at least one of an aromatic group or heteroaromatic group having a substituted or unsubstituted hydrocarbon group of a carbon number of not less than 10.)



(in the general formula (III-2), R^{32} , R^{33} , R^{34} , and R^{35} may be identical to or different from each other, and which are a hydrogen atom, a substituted or unsubstituted hydrocarbon group of a carbon number of 1-30, respectively, provided that at least two of R^{32} , R^{33} , R^{34} , and R^{35} are hydrocarbon groups having a carbon number of not less than 10.)

10. A curable resin composition as claimed in any one of claims 1-3, wherein said thermally-activating ionic polymerization catalyst (3) contains at least one kind selected from the group consisting of a compound represented by general formulae (III-1) and (III-2),

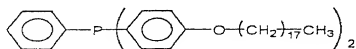
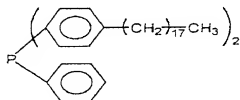
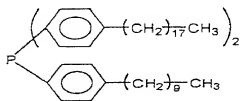
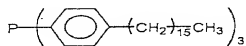
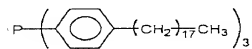


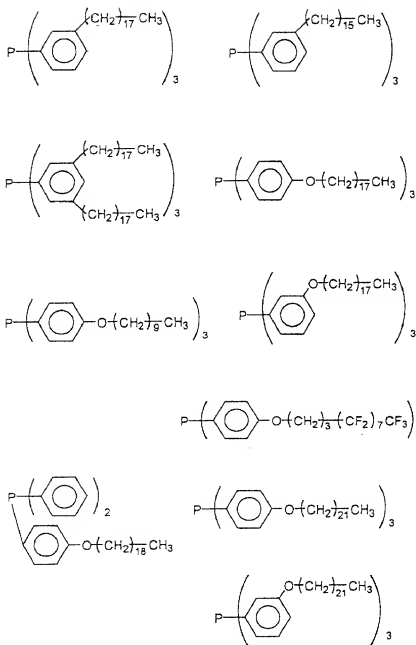
(in the general formula (III-1), R^{31} may be identical to or different, and which are a hydrogen atom, or a substituted or nonsubstituted hydrocarbon group of a carbon number of 1-30, provided that at least one R^{31} in one molecule has a carbon number of not less than 10. "h", "i", and "j" are an integer of satisfying "h+i+j=3", and "m" is an integer of 1-5.)



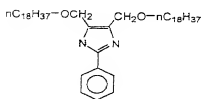
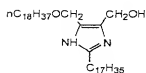
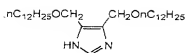
(in the formula (III-2), R^{32} , R^{33} , R^{34} , and R^{35} may be identical to or different from each other, and which are a hydrogen atom, or a substituted or nonsubstituted hydrocarbon group of a carbon number of 1-30, respectively, provided that at least two of R^{32} , R^{33} , R^{34} , and R^{35} are a hydrocarbon group having a carbon number of not less than 10.)

11. A curable resin composition as claimed in claim 10, wherein said compound represented by general formula (III-1) is at least one kind selected from groups shown below.





12. A curable resin composition as claimed in claim 9 or 10, wherein said compound represented by the general formula (III-2) is at least one kind selected from the group shown below.



13. A curable resin composition as claimed in any one of claims 1-12, which is employed for coating cans.
14. A method for the preparation of a curable resin composition characterized in that there is prepared an acrylic resin (i-2) having functional groups which are capable of reacting with ionic species in a curable resin composition as claimed in any one of claims 1-12 under a condition of the absence of a volatile solvent by polymerizing monomers constructing an acrylic resin (i-2) in an epoxy compound (i-1).
15. A coated article which comprises coating a curable resin composition as claimed in any one of claims 1-12 on a substrate, and curing.
16. A solvent-based coating composition which comprises (ii-1) an epoxy compound having at least two cycloaliphatic epoxy groups in the molecule and a number average molecular weight of not more than 2,000, (ii-2) an acrylic resin containing an epoxy group and having a number average molecular weight of 2,000-50,000, a hydroxyl group value of 10-250 mgKOH/g,

and an epoxy equivalent of not more than 300, and (3) a thermally-activating ionic polymerization catalyst which can dissolve by heating and crystallize by cooling.

17. A solvent-based coating composition as claimed in claim 16, wherein said epoxy group in said acrylic resin (ii-2) containing an epoxy group is a cycloaliphatic epoxy group or an epoxy group derived from glycidylmethacrylate.

18. A solvent-based coating composition as claimed in claim 16 or 17, wherein said epoxy compound (ii-1) further contains at least one kind selected from a bisphenol-type epoxy resin, a novolak-type epoxy resin, and a brominated-type epoxy resin therefrom.

19. A solvent-based coating composition as claimed in claims 16-18, wherein oxirane oxygen concentration is 5-11% by weight in a resin composition composed of said epoxy compound (ii-1) and said acrylic resin (ii-2) containing an epoxy group.

20. A solvent-based coating composition as claimed in claims 16-19, wherein said thermally-activating ionic polymerization catalyst (3) is a catalyst as described in claims 4-12.

21. A solvent-based coating composition as claimed in claims 16-20 which is employed for coating cars.

22. A coated article which comprises coating a solvent-based coating composition as claimed in claims 16-20 onto a substrate, and curing.

23. A resin composition for insulating a laminated printed circuit board which comprises (iii-1) a monomer having at least one functional group having ionic polymerizability, (iii-2) a polymeric compound having at least one functional group having ionic polymerizability, and (3) a thermally-activating ionic polymerization catalyst which can dissolve by heating and crystallize by cooling.

24. A resin composition for insulating a laminated printed circuit board as claimed in claim 23, wherein said monomer (iii-1) has a viscosity of not more than 1,000 cP/25°C and 1-2 pieces of epoxy groups in the molecule, and at least one of said epoxy groups is a cycloaliphatic epoxy group.

25. A resin composition for insulating a laminated printed circuit board as claimed in

claim 23 or 24, wherein said polymeric compound (iii-2) has a cycloaliphatic epoxy group.

26. A resin composition for insulating a laminated printed circuit board as claimed in any one of claims 23-25, wherein said polymeric compound (iii-2) is an acrylic resin polymerized in said monomer (iii-1) containing 3,4-epoxycyclohexylmethyl (meth)acrylate.

27. A resin composition for insulating a laminated printed circuit board as claimed in any one of claims 23-26, wherein said thermally-activating ionic polymerization catalyst (3) is a catalyst described in claims 4-12.

28. A laminated printed circuit board which comprises coating a resin composition for insulating a laminated printed circuit board as claimed in any one of claims 23-27 onto a substrate and curing, which has resin layers for insulating between layers.

29. A curable resin composition which comprises (iv-1) an epoxy resin having ionic polymerizability and (3) a thermally-activating ionic polymerization catalyst which can dissolve by heating and crystallize by cooling.

30. A curable resin composition as claimed in claim 29, wherein said epoxy resin (iv-1) is a polyfunctional epoxy resin and at least one of epoxy groups is a cycloaliphatic epoxy group.

31. A curable resin composition as claimed in claim 29 or 30, wherein said thermally-activating ionic polymerization catalyst (3) is a catalyst as described in claims 4-12.

32. A protecting layer for a color filter which comprises coating a curable resin composition as claimed in any one of claims 29-31 onto a substrate, and curing.

33. A color filter using a protecting layer for a color filter as claimed in claim 32.

34. A liquid crystal display device using a protecting layer for a color filter as claimed in claim 32.

35. A curable resin composition which comprises (v-1) an epoxy compound having ionic polymerizability and a viscosity of not more than 1,000 cP at 25°C, (v-4) an oxetane compound having 1-6 pieces of oxetane rings in one molecule, and (3) a thermally-activating ionic polymerization catalyst which can dissolve by heating and crystallize by cooling.

36. A curable resin composition which comprises (v-1) an epoxy compound having ionic polymerizability and a viscosity of not more than 1,000 cP at 25°C, (v-2) an acrylic resin having a functional group of ionic polymerizability, (v-4) an oxetane compound having 1-6 pieces of oxetane rings in one molecule, and (3) a thermally-activating ionic polymerization catalyst which can dissolve by heating and crystallize by cooling.

37. A curable resin composition as claimed in claim 35 or 36, wherein said epoxy compound (v-1) has one 1-4 pieces of epoxy groups in the molecule, and at least one piece of said epoxy groups is a cycloaliphatic epoxy group.

38. A curable resin composition as claimed in any one of claims 35-37, wherein said epoxy compound (v-1) further contains at least one kind selected from a bisphenol-type epoxy resin, a novolak-type epoxy resin, and a brominated-type epoxy resin therefrom.

39. A curable resin composition as claimed in any one of claims 36-38, wherein said acrylic resin (v-2) has a hydroxyl group and, a glycidyl group and/or a cycloaliphatic epoxy group.

40. A curable resin composition as claimed in any one of claims 35-39, wherein said thermally-activating ionic polymerization catalyst (3) is a catalyst as claimed in claims 4-12.

41. A curable resin composition as claimed in any one of claims 35-40, which is employed for coating cans.

42. A coated article which comprises coating a curable resin composition as claimed in claims 35-40 onto a substrate, and curing.